IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

NOVOZYMES A/S, Plaintiff v. GENENCOR INTERNATIONAL, INC., and ENZYME DEVELOPMENT CORPORATION Defendants	C.A. No. 05-160-KAJ

PLAINTIFF NOVOZYMES'
FINDINGS OF FACT AND CONCLUSIONS OF LAW ON DAMAGES

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Abbreviations and Citations In This Document

Citations are to numbered pages of the trial record, presented as an Appendix for the liability and damages phases of the case. Line numbers are indicated by a colon, e.g. **A5017:5-9** means lines 5-9 of page **A5017**. "**TE**" indicates a trial exhibit. **"DI"** indicates Docket Index. Emphases in quotations are added unless otherwise indicated. The Plaintiff Novozymes A/S will be referred to as "Novozymes" unless the context calls for a distinction between Novozymes A/S and its wholly U.S. owned subsidiary Novozymes of North America, at which point the two entitled will be referred to as "A/S" and "NA" respectively. The Defendants Genencor International, Inc. ("GCI") and Enzyme Development Corporation ("EDC") will be referred to collectively as Genencor.

I. FINDINGS OF FACT

A. INTRODUCTION

1. This is a patent case involving United States Patent No. 6,867,031 entitled "Amylase Variants" (the "'031 patent"), which relates to a genetically engineered alpha-amylase enzyme.

2. Alpha-amylase enzymes are used to break down and liquefy starches in a number of industries, including the fuel ethanol industry. To make fuel ethanol, ground grain is mixed with water heated to about 85°C. The mixture becomes thick and viscous. Enzymes are used to make the mixture flowable and to reduce its viscosity. The mixture is also acidic so the enzymes must function at high temperature and under acidic conditions. **A15088:10-24**.

3. In wet milling, the corn is soaked and is then milled so that the starch is separated from the protein and fiber in the corn kernel so the starch can be processed alone. **A15108:19-21**.

4. In dry milling, the entire kernel is ground so that all three components, starch, protein, and fiber, are unseparated and are processed together. **A15108:24-15109:2**. The presence of the other components in addition to starch affects the performance of the enzymes used in the fuel ethanol process. **A15109:2-3**.

5. Plaintiff, Novozymes A/S ("Novozymes"), alleged that defendants Genencor International, Inc. ("Genencor") and Enzyme Development Corporation ("EDC") (jointly "Genencor") infringed the '031 patent, through Defendants' United States manufacture, use, offer for sale, sale, and/or import of alpha-amylase products under the tradename Spezyme® Ethyl and/or other products manufactured by Defendants that contain the same alpha-amylase.

6. Defendants denied infringement of the '031 patent, and asserted that the '031 Patent is invalid and unenforceable.

7. The Court bifurcated this case and held a bench trial on the liability phase on March 6-9, 2006.

8. On August 24, 2006, the Court ruled that Defendants infringed claims 1, 3, and 5 of the '031 patent, that the '031 patent is valid, and that the '031 Patent is enforceable.

9. A second trial on the issues of damages, injunctive relief, willful infringement, and exceptional case was held on October 10-12, 2006.

B. THE ISSUES

10. The issues to be decided by the Court are:

(i) Whether NA has standing to join this lawsuit as a co-plaintiff.

(ii) Whether Novozymes is entitled to a permanent injunction under 35 U.S.C. § 283, enjoining Genencor from infringing claims 1, 3 and 5 of the '031 patent, and from using, manufacturing, marketing, selling, distributing, importing or otherwise commercializing the Spezyme® Ethyl in the United States or otherwise inducing other parties to do the same.

(iii) Whether Novozymes is entitled to damages and if so, the amount of damages to be awarded under 35 U.S.C. § 284 to compensate for infringement of the '031 patent by Genencor.

(iv) Whether infringement by Genencor is willful, and if so, whether enhanced damages should be awarded to Novozymes pursuant to 35 U.S.C. § 284.

(v) Whether this should be considered an exceptional case under 35 U.S.C. § 285, and if so, whether Novozymes should be awarded its reasonable attorney fees.

C. THE PARTIES

11. A/S is a Danish corporation with a place of business in Bagsvaerd, Denmark. **DI101 at III.A.**

12. NA is an indirect wholly owned U.S. subsidiary of A/S. **A15009:2-3; A15011:3-8; TE 742, A16844-16846**; **DI194 at III.E**.

13. GCI is a Delaware corporation having a principal place of business in Palo Alto, California. **DI101 at III.B**.

14. EDC is a Delaware corporation having a principal place of business in New York, New York. **DI101 at III.C**. EDC is a United States distributor of GCI's Spezyme Ethyl products. **DI101 at III.W**.

D. STANDING

15. A/S is the parent company of NA and holds 100% of about 40 subsidiaries around the world. The global company employs about 4,300 people. **A15053:6-19**.

16. A/S owns 100 % of Novozymes U.S., Inc., a United States subsidiary holding company, which, in turn, owns 100% of three United States subsidiaries: NA, Novozymes Biologicals, Inc., and Novozymes, Inc.. **A15053:20-15054:15; A15161:1-7**. The holding company was established to enable Novozymes to file a consolidated tax return in the United States. **A15160:20-25; A15162:20-25**.

17. NA manufactures and distributes industrial enzymes. **A15162:4-6**. It manufactures and sells products for the fuel ethanol industry. **A15162:7-9**.

18. Novozymes, through NA, manufactures Liquozyme and Termamyl in North Carolina, which it sells, through NA, to the United States fuel ethanol industry. **A15162:10-16**. TE480 illustrates Liquozyme and Termamyl sales for the period from January 1, 2006 to June 19, 2006. **A15172:19-24; TE480, A16596-16603**.

19. Novozymes Biologicals, Inc. manufactures and distributes microorganisms which are used for industrial drain cleaning, turf management, and shrimp farming. **A15161:9-14**. It does not manufacture or distribute products for the fuel ethanol industry. **A15161:15-18**.

20. Novozymes Inc. is a contract research and development provider. **A15161:21**. It does not provide or distribute any products for the fuel ethanol industry. **A15161:22-24**.

21. Novozymes functions as one global company. **A15009:1-3; A15014:4-11; A15018:2-4**.

22. A/S exercises complete strategic control over NA. **A15009:4-7; TE 742, A16844-16846**. Day to day NA decisions are made by NA, but strategic decisions and directions are made and given by A/S, e.g., the type of products produced at each plant, tax strategy, and employee hiring. **A15163:9-20**.

23. Novozymes is organized into worldwide industry strategy groups ("ISG"s). **A15010:18-19**. There are eight ISGs, one of which is for the fuel ethanol area. **A15010:19-25**.

24. The ISGs oversee the strategy goals of the entire company and set the direction of the company, including NZNA. **A15010:16-15011:2**. ISGs are responsible for global portfolio planning and product introduction. They are the gatekeepers of the technical process from research and development to launch. **A15011:7- 15014:11; A15163:7-20**.

25. The biofuel starch ISG has six members. Five are from A/S and are responsible for research and development, production, licensing and strategy, optimization, and marketing. One is from NA, and he shares responsibility for research and development. **A15013:6-14**.

26. The biofuel starch ISG makes sure the right products are launched; oversees the optimization of products, licensing, and intellectual property strategy such as what to patent and what to do with Novozymes' patents; and sets overall pricing and licensing strategy. **A15012:4-25; A15013:15-21**.

27. Novozymes' marketing directors head global marketing teams which oversee the technical issues including those in North America. **A15013:15-15014:3**. All marketing directors but one are stationed in Denmark. The other is stationed in China. **A15011:24-15012:3**.

28. A/S sets the financial policies for all of the Novozymes family of companies. **A15055:8-14**. The finance department at NA reports to the A/S finance department. **A15052:23-25**.

29. NA is required to report all of its financial transactions to A/S because A/S is the publicly traded company and must comply with international accounting rules governing consolidated reporting. **A15055:23-15056:8; A15164:22-15165:6**.

30. NA's profits are consolidated into the overall profit statement of the entire Novozymes group after the elimination of intercompany transactions. A loss for NA would be reflected as a corresponding loss in the consolidated statement by A/S. **A15166:9-12; A15167:3-8**.

31. Consolidated profits and losses are reported in the A/S annual report. **A15165:23-15166:8; TE456A, A16550-16591**.

32. A/S controls the profits earned and cash received by NA. **TE 742, A16844-16846**. A/S consolidates the profits and losses of all of its subsidiaries into audited financial statements for the entire Novozymes group. **A15052:16-24; TE 742, A16845-16846**. Because NA is a 100 % owned subsidiary of A/S, all of NA's profits or losses are consolidated into A/S' profits or losses. **A1558:1-6**.

33. In consolidation, all internal transactions are eliminated. **A15065:14-16**.

34. Any loss in this consolidated accounting is the same whether it is measured at the A/S or the NA level. **A15303:16-19**.

35. Financial information (sales, production costs, taxes, and royalty expenses) of each Novozymes affiliate can be seen by A/S in real time. **A15164:11-18.**

36. Shares of A/S are traded on the Copenhagen stock exchange, and it is the only Novozymes entity that is publicly traded. **A15055:7-8; A15056:15-17.** Novozymes shares are traded on the basis of the performance of all of the Novozymes companies as a group and its consolidated financial statement. **A15056:18-21; TE 742, A16845-16846.**

37. Novozymes' annual report (**TE456A**) is audited by PWC. **A15057:4-16.** The annual report is filed with the Copenhagen Stock Exchange and with the U.S. S.E.C. **A15060:5-13.**

38. A/S can use any of the resources of any of its affiliates. **A15043:6-9.**

39. NA's five member board of directors is comprised of four A/S executives and the president of NA. **A15014:12-25; A14163:1-6; TE 742, A16844-16846.**

40. A/S competes in the U.S. fuel ethanol alpha amylase market by manufacturing and selling alpha-amylase products under several variations of the tradename "Liquozyme®", including Liquozyme® SC, Liquozyme® DS, and Liquozyme® NX (collectively, the "Liquozyme Products") exclusively through its U.S. subsidiary, NA. **A15022:12-14; A15030:24-15031:5; DI194 at III.E; TE742, A16844-16846.**

41. A/S owns all of the technology of the global company. Ownership of anything invented anywhere in the global company is vested in NAS. **A15018:7-12.**

42. A/S is the owner by assignment of the '031 patent. **A15017:14-16; DI101 at III.I.**

43. NA produces, markets, sells, and distributes products covered by another A/S patent which is closely related to the '031 patent and falls within the same family of patents as the '031 patent. **A15019:15-15020:23; TE 742, A16844-16846.** That patent is U.S. Patent No.

6,297,038 ("the '038 patent"), entitled "Amylase Variants". **TE392, A16188-16229**. The '038 patent also is directed to alpha-amylases used in the fuel ethanol industry. **A15020:18-23**.

44. As a general company policy, Novozymes does not license its core technology, including industrial enzymes, outside of its corporate family. **A15022:12-14; 31:24-32:5; TE 742, A16844-16846**.

45. All of the Novozymes companies generally have some right to use, in some manner, A/S' technology as required for the Novozymes family of companies to operate most efficiently. **A15018:1-3**. However, NA is the only manufacturer and distributor of the Liquozyme products in the United States. **DI194 at III.F**.

46. A/S and NA are parties to a technology license agreement ("Technology License") that formally provides NA with rights to use all of A/S' technology. **TE240, A16028; A15018:15-22**. The Technology License is primarily in place for tax purposes. **A15026:21-15027:5**. While the '031 Patent is not specifically named therein, the Technology License conveys to NA the rights to use the technology covered by the '031 and '038 Patents. **A15027:6-9**.

47. A/S provides technology to NA, and NA pays royalties to A/S in return. **A15064:21-66:1**.

48. NA has always had the exclusive right to the sell products covered by the '031 and '038 Patents in North America. **A15018:4-6. A15026:13-21**. NZNA has always been and continues to be effectively the sole licensee of the '031 and '038 Patents. **A15018:23-A15019:7, A15034:17-A15035:7, A15039:3-8; TE742, A16844-16846**.

49. NA is the only company that A/S would allow to sell products and to operate under either the '038 or '031 patents, as these patents relate to core technology, alpha-amylases for the fuel ethanol industry. **A15034:19-15035:7**.

50. NA has the exclusive right to produce, market, sell, and distribute products covered by the patent claims included in A/S' patent portfolio in order to compete in the U.S. fuel ethanol alpha amylase market, including an implied exclusive license to the '031 patent. **A15017:13-A15019:14, A15022:7-17; A15024:16-A15035:7, A15038:18-A15039:8; TE742, A16844-16846**.

51. NA's rights under the '031 patent are available to the extent necessary for Novozymes to most effectively compete in the United States, and especially in the U.S. fuel ethanol market. **A15019:8-14; A15022:7-17**. Although the Technology License states that the license is non-exclusive, it functions as an exclusive license. **A15029:3-A15030:23**. The reason that the license states "non-exclusive" is that it is a blanket license to all of the A/S technology. However, in certain product areas where Novozymes may sell a non-core product through A company other than NA, such as the wine area, the rights to NA must be stated as non-exclusive. Since there is a single agreement and all of the Novozymes entities are commonly-owned, it was more expedient to state the license as non-exclusive. The license is treated as an exclusive license from AS to NA in Novozymes' core areas in North America, and certainly in the fuel ethanol market. **A15029:21-15030:16; A15039:3-8; A15043:16-A15044:3; A15045:14-15**.

52. Henrik Meyer is the Vice President of Marketing of Novozymes. **A15007:1-5**. He reports to Novozymes' Executive Vice President of Business Operations. **A15007:11-13**. He understands the overall global corporate make up of NAS and is responsible for global marketing. All marketing directors, including the biofuel starch industry marketing director,

report to him. He oversees all of Novozymes' strategies and all of its technical work, including those for North America. **A15007:17-A15008:3; A15009:24-A15010:2; A15010:7-15011:25; A15013:1-5**.

53. Mr. Meyer testified that "It would be very stupid to invite competition in such an area. We definitely don't do that." **A15039:7-8**.

54. A/S and NA have operated and continue to operate as though the agreement between them were an exclusive license. **A15030:24-15031:5**.

55. A/S has no intent to license the '031 patent outside of its corporate family. **A15015:19-A15017:13; A15018:23-15019:7; A15034:17-15035:7; A15039:3-8; TE742, A16844-16846**.

E. PERMANENT INJUNCTION

56. Spezyme Ethyl and Liquozyme are both directed to the dry mill industry. **A15109:11-14**.

57. Liquozyme was the first alpha-amylase that was designed specifically for the dry mill industry. **A15108:13-15109:24**.

58. Previous products, like Genencor's earlier Spezyme Fred product, were offshoots of those used in the wet mill industry. **A15109:14-24**.

59. Genencor claims to have stopped manufacturing Spezyme Ethyl in the U.S. on August 24, 2006. **A15420:20-24**.

60. However after August 24, 2006, Genencor made a new shipment of Spezyme Ethyl to a customer in the U.S. **A15421:16-18**.

61. Furthermore, Genencor customers are still using their existing inventories of Spezyme Ethyl. **A15410:20-411:1**.

62. Genencor testified that :

(i) Genencor does not *currently* have plans to manufacture Spezyme Ethyl in the U.S. **A15420:25-421:2**.

(ii) Genencor does not *currently* import Spezyme Ethyl into the U.S. **A15421:3-5**.

(iii) Genencor is not *currently* making any efforts to obtain new customers in the U.S. for Spezyme Ethyl. **A15421:6-8**.

(iv) Genencor does not *currently* export Spezyme Ethyl made in the U.S. outside of the country. **A15421:9-11**.

63. Genencor did not offer any testimony to the effect that it would not, during the term of the '031 patent, manufacture, use, offer to sell, or sell in the U.S., import into the U.S., or export from the U.S. any product that infringes the '031 patent, including Spezyme Ethyl.

64. Genencor has not withdrawn from the dry mill U.S. fuel ethanol industry alpha-amylase market and has not indicated any intent to do so.

F. LOST PROFITS

65. RSH is raw starch hydrolysis or a cold cook process. No heat is used to cook the mash. **A15142:22-15143:5**. Liquozyme and Spezyme Ethyl are not used in RSH. **A15143:8-11**.

66. In 1999, there were about 30 fuel ethanol plants in the U.S. In March 2005, there were 77. Today there are just over 100. **A15112:21-15113:6**.

67. Today, some groups of customers pool their purchases and use that total volume as an opportunity to negotiate better prices. 114:13-20. These buying groups include Broin, Renewable Products Buying Group ("RPBG") and United Bioenergy ("UBE"). **A15114:3-9**.

68. RPBG has a subcommittee with representation from each member company. This subcommittee decides which enzymes the group members will buy. The group members buy all

of their requirements for any individual enzyme from one supplier. However, they do not necessarily buy all of their different enzymes from the same single supplier. **A15115:2-15116-3**.

69. Engineering firms design and build new ethanol plants. These plants are required to meet performance guarantees. Therefore, the engineering firms make recommendations as to which enzymes should be used in order to meet these performance guarantees and to operate trouble-free. The plants built any single engineering group all buy the same enzymes form the same supplier. ICM is an engineering group which designs and builds ethanol plants and which recommends to its customers which enzymes they should use. **A15116:10-A15117:11**.

70. Genencor remains Novozymes' only real competitor as in the U.S. ethanol market, alpha-amylase products are currently supplied almost exclusively by two competitors, NZNA and Genencor, and there are no foreseeable new entrants. **A15107:1-15110:11; A15180:2-A15184:5; DI194 at III.L**.

71. Liquozyme is available in three different strengths - SC (single strength), DS (double strength), and NX (quadruple strength). **A15105:10-17**. These can be used interchangeably by adjusting the amount used based upon the concentration of the product. ***Id***.

72. Spezyme Ethyl was launched in April 2004. **A15102:2-4; A15114:17-18; DI194 at III.B**.

73. Spezyme Ethyl was only available in a single strength. **A15105:21-25**.

74. Dr. Julie L. Davis is a principal of Davis & Hosfield , a Chicago consulting firm. **A15229:5-13**. She has extensive experience in the determination of patent damages including those in cases like the present one which involve biotechnology. **A15230:7-17**. She is Novozymes' expert damages witness.

75. Ms. Davis followed the *Panduit* factors in her lost profits analysis. **A15234:24-15235:3**.

(a) Demand for the Patented Product

76. Ms. Davis concluded that there were 7-8,000,000 kilos of Spezyme Ethyl sold from the issuance of the '031 Patent until September 30, 2006. **A15236:14-18**. She testified that she "concluded that there is definitely a demand for the patented product. I understand that that demand is related primarily to the benefits associated with the patented technology." **A15236:21-24**.

77. Jeffrey L. Faller is the Industry Sales Manager for the Ethanol Group of NA in Franklinton, North Carolina. **A15085:16-21**. He manages a team of sales representatives who call primarily on the fuel ethanol industry. **A15086:1-4**. He was hired by NA because it was "putting a major focus on the fuel ethanol industry, had a new product, new alpha-amylase, Liquozyme, that they [NA] were launching to the industry." **A15087:3-7**. Mr. Faller has been involved with converting NZNA's customers (*i.e.*, ethanol plants) to Liquozyme. **A15087:13-15**. He would make plant visits and teach these customers about Liquozyme. **A15087:19-15088:2**.

78. Liquozyme was successfully sold due to its viscosity reduction properties, its thermo-stability, the lack of a need for calcium, and its ability to work at acidic conditions. Mr. Faller testified that "all of that put together gave the plants this operational flexibility. It was kind of a forgiving enzyme in their process." **A15089:14-15090:10**.

79. Spezyme Ethyl has the same desirable properties as Liquozyme but was offered at an appreciably lower price. A number of NZNA customers switched from Liquozyme to Spezyme Ethyl, and some of the new ethanol plant business was diverted to Genencor. **A15102:5-13**.

80. Mr. Faller testified that "[Spezyme Ethyl] was essentially the same product [as Liquozyme] being offered at a much reduced price." **A15102:17-20**.

81. Initially when the Spezyme Ethyl product came on the market, Novozymes decided to maintain its pricing on Liquozyme and to rely on the '031 patent to prevent sales of Spezyme Ethyl. Novozymes thought that it would then be able to regain its market. **A15553:14-15554:1**. This strategy caused Novozymes to lose market share, since only half of the market was still willing to pay a somewhat higher price for Liquozyme as opposed to Spezyme Ethyl. **A15554 2-11**.

82. When it became apparent that Genencor was not going to withdraw Spezyme Ethyl after the '031 patent issued, Novozymes realized that it had to compete with Genencor on price and began to drop its prices on Liquozyme. **A15553:14-15554:1**. Novozymes was forced to lower the price of Liquozyme. **A15102:24-104:2**.

(b) Price Elasticity

83. Price elasticity is the responsiveness of price to quantity. **A15438:17-18**.

84. Dr. David Teece is a professor at University of California - Berkley and is the chairman of LEGC, an economic and finance consulting firm. **A15432:6-10**. He is Genencor's expert damages witness.

85. Dr. Teece testified that there must be price elasticity in any market. **A15451:3-6**.

86. The longer the time period, the higher the elasticity. **A15454:19-20**.

87. Dr. Teece initially testified that that the effect of price elasticity on price erosion would range from $82,800 to $829,000. However, he added that as of March 2005, "I can't give a precise number." He simply stated that ..."there is no reason to believe that it [the price elasticity] can't be as high as one, if not higher." **A15457:10-19**.

88. Dr. Teece also testified that:

(i) he "can't tell you precisely what the right number is …" **A15451:14-15**;

(ii) he was not proposing a price elasticity of the precise numbers in his damages conclusions chart. It could be anything. **A15499:1-4; TE749, A16852**.

(iii) he could not give precise numbers, only ranges, on price elasticity or price erosion. **A15505:15-19**.

89. The "but for" world is what the world would have looked like as of the issue date of the '031 patent had Spezyme Ethyl no longer been available to customers. **A15312:25-15313:9; A15439:7-8**.

90. Dr. Teece never gave a price elasticity value for the dry mill U.S. fuel ethanol industry in the real or the "but for" worlds and could not calculate it based upon the record in this case. **A15505:15-19; A15506:19-15507:2**.

91. When asked about the precise elasticity value over time, Dr. Teece testified that "… I don't know for sure, I have to confess." **A15454:24-25**.

92. Technically, Ms. Davis agreed that price elasticity is not zero. However, she clarified this and testified that "As a practical matter, if Novozymes was trying to sell the Liquozyme product for a million dollars a kilo, they are not going to sell any." "But we are talking about a relevant range that is much different than that. We are talking about prices in kind of a $3 range." "It doesn't seem at all unreasonable to believe that the Spezyme Ethyl customers will pay the same amount as the Liquozyme customers did. In fact, many of those Spezyme Ethyl customers, as we know, used to be Liquozyme customers, so they were buying it at that higher price." **A15535:22-15537:24**.

93. She summarized that "You have to assume no price elasticity within that band of 3 to $4." **A15541:23-24**. "I don't have to assume away all price elasticity, all I have to assume is

that the customer who used to buy Spezyme Ethyl for about $3 is going to be willing to pay about $3.30 for Liquozyme." **A15547:13-19**.

94. Maurice Beto is Genencor's Senior Director of Technical Sales with the Grain Processing Group for the Americas, which includes the dry mill fuel ethanol industry. **A15179;19-15180:1**. He manages Genencor's technical sales account managers. **A15414:23-24**.

95. Ms. Davis also testified that she learned from Mr. Beto's deposition that the cost of alpha-amylase is about a penny out of every dollar of fuel ethanol production cost. She concluded that "So what this suggests is that even if the price of that alpha-amylase were to go up or down by 10 or 20 percent, the effect on the overall cost is inconsequential." **A15537:6-15**.

96. Dr. Teece finally admitted, regarding Ms. Davis's position on price elasticity, that his own damages conclusion chart (**TE751, A16854**) "doesn't prove it [Ms. Davis' position] is incorrect ...." **A15452:5-21**.

(c) Price Erosion

97. Price erosion is the effect that competition with the infringing product had on the prices charged for the patentee's product. **A15294:11-15**. Here, this competition caused Novozymes to lower its price of Liquozyme more than it would have had Genencor not been in the market with the infringing Spezyme Ethyl product. **A15294:16-18**.

98. The price that Novozymes charged in March 2005 for Liquozyme was $3.43/kg. **A15352:4-6**. That price would not have fallen any lower in the absence of competition from the infringing Spezyme Ethyl. **A15352:7-9**.

99. The average selling price of Liquozyme over time is illustrated in TE492A. **A15294:19-295:3**; **TE492A, A16646-16647**. This is a graph of time versus average selling price of Liquozyme. A vertical line indicates the launch of Spezyme Ethyl in April 2004. The top blue line is the selling price of Liquozyme. The red line is the average selling price of Spezyme Ethyl.

Spezyme Ethyl was launched at $3.00/kg while Liquozyme was selling at $3.40/kg. Over time, both price lines trended downward. When the '031 patent issued, the selling price of Spezyme Ethyl was about $2.85 and the selling price of Liquozyme was about $3.35. Prices continued to drop after the '031 patent issued. Any price drop after the issuance of the '031 patent is price erosion and is appropriately included as a component of damages. **A15295:3-15296:8; A15296:25-297:4**.

100. Ms. Davis calculated price erosion by assuming that the price of Liquozyme would have remained consistent at the March 2005 price through the rest of 2005. She assumed a 1 ½% price reduction in 2006 because that is what Novozymes anticipated for 2006 in the absence of Spezyme Ethyl. **A15297:10-18**. This relatively small decrease projected by Novozymes is reasonable since the larger price reductions were due to the entry of buying groups and the volume discounts that followed, they had taken effect before March 2005, and Liquozyme had been around for five or six years by then. **A15317:9-15318:3; A15318:23-15319:4**.

101. Ms. Davis compared the actual sales for the period with the projected value of the sales without price erosion to arrive at the total effect of price erosion on a monthly basis. **A15297:19-15298:2**.

102. Although alpha-amylase prices were declining before Spezyme Ethyl was introduced, Mr. Faller testified that "some of the most significant price declines occurred when there was another product that was infringing on [other] alpha-amylase patents of Novozymes. The Ultra-pHlo product. And during that time was [when] the steepest declines in price occurred. After that product was removed from the market, I would describe it as a more stable pricing." **A15144:5-15**.

103. It is logical, as Novozymes' Mr. Faller testified, that "[I]n the normal course of business, … most people would plan that they would not want to intentionally lower their price unless there was a reason to do that, such as a competitive threat." **A15156:23-15157:1; A15157:22-15158:6**.

104. Dr. Teece could not give a precise number on price erosion. **A15505:15-19**. Rather, he presented ranges and 20 different price erosion damages numbers. **A15506:13-18**.

105. Genencor knew that if it introduced a viable alpha-amylase, there would be price erosion. An August 2003 Genencor report stated that "The current market price for market-leading, engineered *B. stear.* based AA (NZ's Termamyl SC) is $2.80-$3.20/kg. We would anticipate price erosion based on GCOR market entry at a level of 10-40%." **TE230, A16019**.

106. Ms. Davis correctly concluded that "I think it's still appropriate to believe it's more likely than not that Liquozyme would have been the product sold in the market if the Spezyme Ethyl was not available. And that the numbers that we see shown there [**TE484, A16628-16629**] represent the appropriate lost profits and reasonable royalty calculations because of that. Likewise, I think it's completely reasonable to assume that Spezyme Ethyl customers would have paid the same price as Liquozyme customers. And, therefore, the price erosion factor that I have calculated there would remain in that the Liquozyme customers would continue to pay the same price that they did in March of '05." **A15540:12-23**. Ms. Davis was correct when she testified that "… the competition from Genencor caused the price erosion" seen in March 2005. **A15550:1-9**.

107. In the absence of Spezyme Ethyl, the price of Liquozyme could remain the same or increase, but would decline only if it were sold in more concentrated, but more profitable, forms, not if it is only offered in its current form. **A15156:3-21; A15158:7-10**.

108. The total amount of price erosion was $2,692,104. **A15298:190-21; TE484, A16628-16629**.

(d) Absence of Non-Infringing Substitutes

109. Early on, Genencor was the dominant enzyme vendors to the fuel ethanol industry. **A15088:25-15089:6**.

110. The industry was only producing 10-12 % ethanol by volume then which is now considered quite low. **A15089:7-9**.

111. The older alpha-amylase products were inferior to Liquozyme and Spezyme Ethyl. They did not reduce viscosity as well, did not operate at a broad range of pH, were not thermally stable, and required the addition of calcium which caused a build up of calcium scale that needed to be cleaned out. **A15089:10-13; A15107:3-12**.

112. Genencor had isolated *B. stearothermophilus* wild-type alpha-amylases as early as 1982 or 1983. 373:2-8. However, these were not commercialized. **A15373:9-13**.

113. An expression system is a host microorganism which has been developed to take a gene form another microorganism into its own genome and to make protein from that gene. It is like a mini factory. **A15374:13-18**. Genencor developed expression systems over the years since the early 1980s. **A15374:3-5; A15375:1-2**. Genencor developed expression systems for alpha-amylases in the mid 1990s. **A15375:3-4**.

114. Despite all of this, Genencor itself could not develop a successful alpha-amylase product for the U.S. ethanol fuel industry and had to buy another company, EBS, for EBS's alpha-amylase product line. Genencor acquired EBS in 2001 or early 2002. **A15091:25-15092:2; A15371:15-20**.

115. GCI marketed Spezyme Fred, and there were 2 types of Spezyme Fred - Crude and Filtered. **A15090:19-24; A15091:6-9**. Spezyme Fred is a *B. licheniformis* alpha-amylase that

was engineered to have improved performance at low calcium concentrations and higher thermostability than wild-type *B. licheniformis* alpha-amylase. Spezyme Fred does not have any deletions in its amino acid sequence relative to its wild-type. **A15367:7-9.15366:16-20; A15368:6-12**.

116. EDC marketed G995 and G997. **A15090:19-24**. G995 and G997 were wild-type *B. stearothermophilus* alpha-amylases. **A15091:22-24**.

117. Spezyme Fred, G995, and G997 dominated the market before the introduction of Liquozyme. **A15093:19-23**.

118. Novozymes marketed a wild-type alpha-amylase product before the introduction of the genetically engineered alpha-amylase, Liquozyme. A15093:21-15093:1. Novozyme's wild-type enzyme had a low market share of about 20%.A15093:2-7.

119. Liquozyme took over the market upon its introduction. Mr. Faller testified that "As [NZNA] would go from plant to plant, word of mouth, that the testimonials from customers started to take hold and they would tell each other of the successes they had with our product [*i.e.*, Liquozyme] and we just successively picked up more and more business." **A15093:24-15094:7**. "The customers were seeing some real demonstrable differences between these products [Liquozyme v. Spezyme Fred, G995 and G997]." **A15094:11-21**.

120. Liquozyme increased ethanol yields to up to 20%. **A15096:25-15097:4**. Plant fuel costs were reduced with Liquozyme. **A15096:1-4**. Liquozyme also helped the plants to reduce their capital expenditures on equipment since it enabled the plants to use their current equipment more efficiently. **A15098:15-25**.

121. G995 and G997 were not competitive products with Liquozyme or Spezyme Ethyl in March 2005. Novozymes' Mr. Faller testified that "They were virtually eliminated from the marketplace …." **A15111:15-22**.

122. G995 and G997 were less flexible products that had increased viscosity over Liquozyme so plants could not be run with high solids content and at high performance with the former two. **A15111:23-15112:10**.

123. Spezyme Fred was sold as an alpha-amylase product to the U.S. dry mill fuel ethanol market for the past several years and before Spezyme Ethyl entered the market. **A15417:11-16**.

124. Dr. Teece claimed that some Spezyme Ethyl customers may be satisfied with substituting Spezyme Fred. Ms. Davis disagreed because sales of Spezyme Fred were stable before and after the introduction of Spezyme Ethyl. This means that Spezyme Ethyl buyers were not Spezyme Fred buyers who switched to Spezyme Ethyl and then returned to Spezyme Fred when Spezyme Ethyl was withdrawn. **A15247:2-13**. Genencor's Mr. Beto's testimony was consistent with Ms. Davis. Mr. Beto testified that Genencor did not have a comparable enzyme in terms of functionality for starch liquefaction at the time that Liquozyme entered the market. **A15181:3-7**. He added that with the introduction of Liquozyme, Novozymes became the dominant player in the market and maintained that position until the introduction of Spezyme Ethyl. **A15181:13-19**.

125. Spezyme HPA is a combination of Spezyme Fred and an *Aspergillus niger* phytase. The phytase is added to free up minerals that enhance the performance of alpha-amylases. **A15107:25-15108:11**. Neither of the components of Spezyme HPA has any deletions in their amino acid sequences relative to their wild-types. **A15370:11-20**.

126. Before Spezyme Ethyl was on the market, some people used Spezyme Fred and Spezyme HPA. **A15136:15-21**. At the time of entry of Liquozyme, Spezyme Fred and Spezyme HPA could not compete with Liquozyme SC. **A15181:20-24**. The viscosity properties of Spezyme Fred and Spezyme HPA were not, and still are not, as good as Liquozyme. **A15181:25-183:5**.

127. Without Spezyme Ethyl, Genencor did not have an alpha-amylase with the right combination of thermal stability, viscosity reduction, and acid tolerance to compete with Liquozyme in March 2005. **A15182:6-16; TE228, A16003-16004 at ¶¶8-10**. This was the combination of properties that, in March 2005, the main purchasers of alpha-amylases desired. **A15182:17-22**.

128. Mr. Beto agreed that the activity profile of *B. licheniformis* alpha-amylases such as Spezyme Fred was not well suited to mash liquefaction in fuel ethanol production. Therefore, Genencor's customers were demanding an alpha-amylase product that was better suited for fuel ethanol production than Spezyme Fred. **A15183:16-15184:5; TE228, A16004 at ¶10**.

129. Dr. William D. Crabb is Genencor's Vice-President of Applications. **A15202:5-6**. He coordinates Genencor's local applications across all of its business units. His responsibilities included the dry mill fuel ethanol industry and Spezyme Ethyl. **A15202:9-13**.

130. Dr. Crabb admitted that Genencor's alpha-amylases prior to Spezyme Ethyl had technical and economic problems that rendered them unviable against Liquozyme in the dry mill fuel ethanol market. **A15203:3-10**.

131. Some customers chose to buy Spezyme Fred even after Spezyme Ethyl was introduced because it has different properties than Spezyme Ethyl. **A15417:17-15418:3**. The dry fuel ethanol industry is different than the broader overall alpha-amylase market because there are

some customers that have always used Spezyme Fred. **A15243:7-14**. For example, Spezyme Fred was useful for high fructose corn syrup sweetener producers. **A15183:16-20**. Spezyme Fred accounted for only a small amount of sales by March 2005. Rather, Genencor was "consistently offering Spezyme Ethyl." **A15107:15-24**.

132. Generally, customers would switch from Spezyme Fred to Liquozyme and after a trial period, move to Liquozyme and once Spezyme Ethyl was available, move to Liquozyme or Spezyme Ethyl. They typically did not switch back. **A15110:14-23; A15112:11-15**. Perhaps one plant out of 77 did. **A15112:16-15113:1**.

133. Genencor's Dr. Crabb testified that Spezyme Xtra is a *B. stearothermophilus* alpha-amylase expressed in a *B. licheniformis* host and that its amino acid sequence is identical to the corresponding wild-type except that it is lacking the 29 amino acids at its C-terminal. **A15400:24-401:3**.

134. Spezyme Xtra was also known at different points in its development as GC100 and/or Ethyl 4. **A15194:3-8**.

135. In March 2005, there was no Spezyme Xtra product. Its development at Genencor had not even been started. A15350:17-25. Development of Spezyme Xtra began in June of 2005, and product was not available until June or July 2006. **A15194:9-21; A15351:1-6**. Ms. Davis correctly concluded that "Therefore, in March 2005 it would have been unclear, at best, as to when or if such a product would have been available." **A15351:6-8**.

136. In summary, there were other products on the market such as Spezyme Fred, variations of Spezyme Fred, and Spezyme Xtra, but they would not have been acceptable to customers who had already purchased Spezyme Ethyl. **A15237:8-22**. As of March 2005, the

market did not consider Spezyme Fred a satisfactory substitute for Liquozyme or Spezyme Ethyl. **A15109:25-15110:11**.

137. In March 2005, there were only two competitive products - Liquozyme and Spezyme Ethyl. **A15117:12-14**. Genencor's Mr. Beto agreed that, in March 2005, the U.S. dry mill fuel ethanol market was a two player market with only Novozymes and Genencor competing. **A15180:6-9**. He further testified that Genencor and Novozymes will be the only significant suppliers of alpha-amylases to this market in the future. **A15180:10-14**.

138. In June 2005, Valley Research announced the launch of a product, Ultra-Thin, for the dry mill fuel ethanol industry. **A15117:18-21**.

139. Ultra-Thin did not perform well in plant trials. Mr. Faller explained that it "just was not economically viable." **A15118:11-15**. Using Ultra-Thin would cost 2-3 times as much as using Liquozyme or Spezyme Ethyl. **A15118:18-23**. The one plant that was using Ultra-Thin has even switched to Liquozyme. **A15118:8-11**.

140. Genencor, in April 2006, reported that "… you have to add 5.6x [of Ultra-Thin] on weight compared to our [Spezyme Ethyl] normal dose. It seems highly illogical that a plant would want to dose that high …." **TE 451, A16234-16235**.

141. There was no testimony that Ultra-Thin infringes the '031 patent. **A15187:22-15188:2**.

142. Genencor has not lost any sales of Spezyme Ethyl to Ultra Thin. **A15188:7-9**. Rather, Genencor has been told by one customer that the trial price of Ultra-Thin is so high that the customer was afraid to ask about its regular price and simply avoided the product. **A15188:10-14**.

143. Ultra-Thin has not yet made any significant penetration into the U.S. dry mill fuel ethanol market. **A15188:3-6**. Ultra-Thin has been of little commercial relevance. **A15118:1-5**.

144. Third parties, such as Archer Daniels Midland and China, were competitors only in a highly speculative sense. **A15144:1-20**.

145. However, today even Archer Daniels Midland buys Liquozyme from Novozymes. **A15158:19-25**.

146. Ms. Davis considered Chinese alpha-amylase suppliers, but could not find any evidence that any customers have purchased from Chinese suppliers. **A15244:13-15245:3**.

147. Dr. Teece proposed that if Spezyme Ethyl were not on the market, Valley Research or unnamed Chinese suppliers may have increased their production and sales of products that would be competitive with Liquozyme. Ms. Davis disagreed because this does not reflect the real world in which, from 1999 to 2004, Liquozyme was the only product on the market and neither Valley Research nor the Chinese had marketed any competing product. **A15245:4-21**. Ms. Davis correctly did not consider Ultra Thin in her analysis because only one customer had tried it, they were not satisfied, and it was too expensive. **A15243:22-15244:12**.

148. Ms. Davis focused on was the market for the infringing product – the Spezyme Ethyl customers because, as she testified, "What we really care about is what would those customers have purchased if they could have not obtained Spezyme Ethyl." **A15237:23-15238:4**. "[T]he relevant inquiry for this particular analysis was to try to understand what would have happened had Spezyme Ethyl not been on the market. So for that reason, we have to look at just those customers." **A15238:7-12**.

149. She chose her relevant market because she "would expect the Spezyme Ethyl customers to want the same benefits and advantages that they had enjoyed when they were using

Ethyl so I would expect them to be happy only with the Liquozyme product as an alternative." **A15242:25-15243:6**. "But for those who have converted over to Spezyme Ethyl, they presumedly did so for the reasons that they wanted the higher performance aspects of that product and now would want to continue to enjoy those attributes even if the Ethyl was no longer available to them." **A15243:14-18**.

150. Ms. Davis correctly testified that a review of the overall market for alpha-amylase products leads to the conclusion that "the market we're here to talk about today is really a two-supplier market that deals with Spezyme Ethyl and Liquozyme." Genencor and Mr. Beto agreed. **A15237:23-152387; A15248:12-20**.

151. She explained that "The meaning or result of a two-supplier market is that [if] one of the suppliers no longer has an acceptable product available, then those customers must buy from the only remaining supplier in that market, in this case, Novozymes." **A15248:21-15249:3**. "[W]hen there are only two suppliers, that makes it clear that there is an absence of other acceptable non-infringing substitutes." **A15249:4-8**.

152. Dr. Teece testified that Spezyme Xtra could have been sold as a non-infringing substitute. However, Spezyme Xtra was not available in April 2005 when Spezyme Ethyl would have to have been withdrawn from the market because of the issuance of the '031 patent. Further development of Spezyme Xtra did not begin until June or September 2005 and took about one additional year. Spezyme Xtra did not become available until June or July 2006. **A15247:6-20; A15402:1-3**.

153. Genencor's Dr. Crabb testified that there is no reason why Genencor could not have manufactured Spezyme Xtra in its *B. licheniformis* expression system in the mid 1990s. **A15401:13-20**. He claims that Genencor did not introduce Spezyme Xtra earlier because

Genencor did not see the need to commercialize both Spezyme Ethyl and Spezyme Xtra and that Spezyme Ethyl did not infringe Novozymes' earlier alpha-amylase '038 patent, so Genencor was free to proceed with Spezyme Ethyl. **A15402:4-17**.

154. Dr. Crabb claims it only takes three to four months to develop a product like Spezyme Xtra for sampling to customers. **A15402:21-403:2**. However, that was not the case. Work began on Spezyme Xtra only as a contingency plan in case Spezyme Ethyl was taken off of the market because of this lawsuit. **A15403:11-14**. It was three months just from the time that Genencor had samples of Spezyme Xtra to the time that Genencor could conduct customer trials of the product. **A15429:17-20**. This does not include any development time to get Spezyme Xtra to the sample stage.

155. Things can always go wrong in the development of a product, and things have gone wrong in the development of alpha-amylase products at Genencor. **A15404:11-22**. It is also uncertain if and under what circumstances a plant will accept a trial delivery of an alpha-amylase for a particular application. **A15405:5-12**.

156. Dr. Teece's three to six months to get Spezyme Xtra to market in the "but for" world is unrealistic in light of the fact that it actually took longer in the real world and that Spezyme Ethyl took an additional two years to develop after it was bought from EBS as a product already in development. **A15428:22-15429:1; A15530:11-23**.

157. Enzyme BioSystems was acquired by Genencor in late 2001 or early 2002. **A15184:18-21**. When Genencor acquired EBS, EBS had three alpha-amylases products in development, including EBS-1 and EBS-2. **A15377:15-23**.

158. EBS-1 was Ultra-pHlo which was the first EBS product made by Genencor. It was taken off of the market due to a patent infringement suit brought by Novozymes to enforce the '038 patent. **A15185:14-15186:3**.

159. EBS-2 became Spezyme Ethyl. **A15184:18-21; A15377:24-15378:1; TE230, A16016**. Spezyme Ethyl was important to Genencor so one should assume that it was hurried along as fast as possible. **A15530:11-23**.

160. Furthermore, Spezyme Xtra is a wild-type alpha-amylase similar in properties to Spezyme Fred and inferior to Spezyme Ethyl and Liquozyme. **A15247:6-20**. There is no evidence that those customers willing to try Spezyme Xtra in lieu of Spezyme Ethyl will be satisfied or will stay with Spezyme Xtra in the future. **A15344:5-15**.

161. Dr. Teece's reliance on the acceptability of Spezyme Xtra is suspect because it has not yet been proven in the marketplace. Genencor's Mr. Beto and Dr. Crabb admit that Spezyme Xtra is an inferior product, is not as thermally stable as Spezyme Ethyl, requires more product to have the same effect as Spezyme Ethyl, but is being sold around the same price/kg as Liquozyme. **A15530:24-15531:13; A15534:21-15535: 15; TE274A, A16056-16057**.

162. Genencor, in December 2005, acknowledged the lack of acceptable substitute products. "The truncated wild type Spezyme Ethyl [*i.e.*, Spezyme Xtra] has been worked on in R&D as a potential substitute for our existing product that is currently in litigation for patent infringement with NZ. Our applications data has indicated that this product is inferior to the current GMO Spezyme Ethyl product in regards to product performance. A launch of this product to the industry would be taking a step back as this enzyme would require an appropriate level of calcium to aid in its stability. … The addition of calcium would be viewed by the industry as taking a step back in regards to process and plant optimization." **TE298, A16068**.

163. Genencor also acknowledged, in February 2006, that significantly more Spezyme Xtra would be necessary to give the same effect as Spezyme Ethyl. "The formulation has now been defined - concentration and formulants. It will contain 2x the enzyme dose in order to mimic Ethyl 3 [Spezyme Ethyl]." **TE447, A16232**.

164. Spezyme Xtra has been on the market for four months and in its first three months on the market Genencor sold only 1 truckload/month. It only sold ten truckloads in September 20006. This is not much, so it is too early to tell whether it is an acceptable substitute for Spezyme Ethyl. **A15532:17-24; TE483, A16610-16627**.

(e) Novozymes Could Supply and Service Additional Customers

165. The parties have stipulated that Novozymes would have had adequate manufacturing capacity, starting in March 2005, to manufacture the additional product to meet the needs of the Spezyme Ethyl customer. **DI194 at III.J & K; A15249:24-15250:2**.

166. In Spring 2005, Novozymes had five account managers plus Mr. Faller for the dry mill industry. They called on individual plants, engineering firms, and other dry mill industry enzyme users. **A15123:23-15124:15**.

167. An account manager is responsible for sales, overall relationship, and service of the client. **A15127:12-14**. The annual cost of account mangers is $200,000/individual. **A15127:3-5**. Novozymes' marketing capacity would have been adequate to meet the needs of additional customers since Novozymes was already trying to reach the Spezyme Ethyl customers but could not close sales because these customers were buying from Genencor. **A15251:16-15252:2**.

168. Novozymes could afford to hire and train additional account managers in March 2005. Today, Novozymes has seven account mangers for the fuel ethanol industry, having hired two additional account mangers since Spring 2005. **A15125:12-22**.

169. A technical service person, also called a customer solutions person, helps to conduct plant trials and does trouble shooting. A plant trial is a period in which a plant tries out a new product. They focus on the operational issues of the plant and answer technical questions. **A15111:5-14; A15127:12-19**. The annual cost of a technical service person is $150-175,000. **A15127:6-8**.

170. Novozymes could afford to hire and train additional technical service persons in March 2005. In March 2005, Novozymes had six or seven technical service people. Today it has seven or eight. **A15127:20-25**.

171. Novozymes, in Spring 2005, had sufficient resources to handle conversion of these Genencor's customers to Liquozyme, since Liquozyme and Spezyme Ethyl were interchangeable, as acknowledged by customers such as RPBG. **A15124:16-15125:5**.

172. TE486 is a graph of years v. sales (kg) of Liquozyme. **A15250:12-16; TE486, A16632-16633**. This shows that the additional volume of Liquozyme that Novozymes would have to provide in order to meet the needs or to reach all of the Spezyme Ethyl customers would be less than the volume capacity of Liquozymes Novozymes already had available. **A15251:8-15**.

173. Ms. Davis was correct when she testified that "I concluded that Novozymes has both adequate manufacturing and marketing capacity to make the additional sales represented by the Spezyme Ethyl customers." **A15252:3-7**.

174. Since March 15, 2005, Novozymes, and more specifically NA, has had sufficient resources to meet such demand without having to forego other opportunities for profit. **DI194 at III.K**.

175. If the Defendants were enjoined from selling Spezyme® Ethyl (defined as any Genencor alpha-amylase product sold into the U.S. dry mill fuel ethanol market containing the same alpha-amylase found in Spezyme® Ethyl) as of March 15, 2005, NA had the manufacturing capacity to supply its Liquozyme® SC line of products to all of Defendants' customers that had been purchasing Spezyme® Ethyl. NZNA could have supplied all of the Defendants' Spezyme® Ethyl customers with its line of Liquozyme® SC products without any delay. **DI194 at III.J**.

(f) The Profits Novozymes Would Have Made

176. Liquozyme was the dominant alpha-amylase before the introduction of Spezyme Ethyl. Novozymes' Mr. Faller testified that, "It was desired by customers. It was recommended by the engineering firms." **A15100:23-15101:3**.

177. Liquozyme's market share peaked at about 86 % and then dropped to 48-50% due to Spezyme Ethyl. **A15101:18-15101:1; A15103:4-13**.

178. When Liquozyme was introduced in 1999, the industry made a mass exodus from the old technologies that were available to Liquozyme. The appearance of Spezyme Ethyl gave the industry another product with identical performance to Liquozyme but that was available to them at a lower price in many case. **A15106:19-15107:1**. Customers would switch from Spezyme Fred to Liquozyme and, once Spezyme Ethyl was available, move to Liquozyme or Spezyme Ethyl. **A15110:14-23; A15112:11-15**.

179. In March 2005, Liquozyme and Spezyme Ethyl were the only competitive alpha-amylase products for the fuel ethanol market. **A15106:1-5**.

180. In April 2005, Novozymes met to discuss how it would respond if Spezyme Ethyl were removed from the marketplace. **A15119:10-14**. This was the same time as when Novozymes heard that Genencor was working on a new product. **A15119:15-16**. Novozymes prepared an e-mail (**TE687**) that gave its estimate of the total business, who were Genencor

customers, what those customers were using, and how much business that would translate to for Novozymes if Liquozyme were to replace Spezyme Ethyl. **A15121:12-18**. Switch over possibilities were rated High ("H" 100%), Medium ("M" 75%), Low ("L"), or None ("N" 0%), as of April 28, 2006. **A15122:13-25; TE687, A16654**. "Probability of Gaining AA" included the possibility that Genencor would be offering a product other than Spezyme Ethyl once Spezyme Ethyl was withdrawn from the market. **A15134:18-22**. The percentages were indicative of the amount of work that Novozymes would have to do to covert the plant to Liquozyme, not the probability of success in converting the customer. The lower the percentage, the more work would be necessary. For example, Mid-Missouri was rated at 25% (Low), but today, Mid-Missouri is using Liquozyme. **A15132:7-25**. The Probabilities of Gaining AA (*i.e.*, alpha-amylase sales) and GA (*i.e.*, glucoamylase sales) are not identical for each individual customer. **A15133:8-13**.

181. Genencor's expert, Dr. Teece, did not propose the recapture or conversion rate in his damages conclusion chart **TE749, A16852-16853**. He testified that it could be anything. **A15497:2-15498:6**. He also admitted that when figuring conversion or recapture, he assumed that all of the members of RPBG would act together rather than separately. **A15501:22-15502:4**. He made this same assumption for all buying groups. **A15503:6-18**.

182. RPBG had its annual contract negotiations with enzyme suppliers in May 2005. If Spezyme Ethyl had not been available then, RPBG could not have bought it in place of Liquozyme. Nor would RPBG have likely waited several more months for the possibility that Spezyme Xtra would become available. **A15523:1-12**.

183. Genencor, in February 2006, acknowledged that it would lose 70% of its Spezyme Ethyl customers and $9.8 million dollars in gross margin annually if Spezyme Ethyl were

withdrawn from the market. "Based on 2006 numbers, a switch to Ethyl 4 [Spezyme Xtra] and a loss of 70% of our customers would result in an estimated loss of about $9.8 million in gross margin based on standard costs and sales forecasts ($8.6 million in lost customers, $1.2 million in increased production cost)." **TE447, A16232**.

184. Genencor had 29 Spezyme Ethyl customers at the end of August 2006. **A15424:12-14**.

185. Ten Genencor customers who are using up their remaining Spezyme Ethyl have purchased other Genencor alpha-amylase products to use after they use up their Spezyme Ethyl supply. **A15423:20-15424:11**. However, some of those who elected another Genencor product have been operating under binding supply contracts with Genencor. **A15425:22-25**.

186. By the trial date, a minimum Four former Spezyme Ethyl customers were testing Liquozyme SC, and three others had already decided to purchase Liquozyme SC. **A15424:22-15425:8**.

187. It is logical that Spezyme Ethyl customers would give Genencor an opportunity to supply another alpha-amylase, but it is too early to tell whether those customers will be satisfied with the inferior Spezyme Xtra product. **A15534:5-11**. None of Genencor's Spezyme Xtra purchasers has signed a contract to purchase a specific amount of Spezyme Xtra for a given period of time. **A15427:12-15**. Therefore, these Spezyme Xtra purchasers could cancel their orders and switch suppliers at any time. **A15427:16-18**.

188. Genencor has sold Spezyme Fred, Spezyme Xtra, and Spezyme HPA to a group of 12 customers who had used Spezyme Ethyl. 422:20-423:10. It is logical that these customers purchase one of Genencor's other alpha amylases in the interim before deciding to convert to Liquozyme. **A15309:19-22; A15311:17-21**.

189. Ms. Davis' lost profit and reasonable royalty conclusions are given in TE484. Ms. Davis relied upon documents from Genencor, Novozymes, and EDC to determine damages. **A15252:22-25**. TE484 illustrates Ms. Davis' lost profits and price erosion analyses. **A15231:11-18**.

190. Ms. Davis reviewed documents, interviewed people at Novozymes, reviewed depositions, and heard the live testimony in the damages phase of this trial. **A15232:15-24; A15233:11-18**. She inquired about the market, products, competitors, pricing, costs and expenses, and resulting margins. **A15233:2-9**.

191. Ms. Davis understood lost profits to be the amount of profit that Novozymes lost because it had lost sales of products that it would have sold had Spezyme Ethyl not been on the market after the issuance of the '031 patent. **A15233:22-15234:2**.

192. Ms. Davis did not distinguish between NZNA and NAS because they both lost profits, and since their financial statements are consolidated, they both lost the same amount of profit. **A15234:3-10**.

193. The 40% royalty paid by NZNA to NAS did not figure into her analysis of lost profits since the financial statements are consolidated. This means that a royalty expense to one is royalty revenue to the other and effectively cancel each other out. **A15235:11-23**.

194. Genencor's expert, Dr. Teece, agrees that Novozymes actually lost sales to Spezyme Ethyl and that Novozymes suffered financial harm as a result of these lost sales. **A15493:10-15496:1**.

195. Ms. Davis looked only at the period after the '031 patent issued for her calculation because that is the only period for which Novozymes would be entitled to damages. **A15338:19-25**.

196. TE483 summarizes sales and other financial information from Genencor's records of various products from the issuance of the '031 patent through September 2006. **A15253:8-17**.

197. Ms. Davis' calculations were based upon the price and net margin for Liquozyme SC which is the single strength product. If she had considered Liquozyme DS, the double strength product, or Liquozyme NC, the quadruple strength product, the damages would have been higher since the latter two products are more profitable than Liquozymes SC. **A15256:4-13**.

198. Ms. Davis used the price that Novozymes would have charged at the time the '031 patent issued (*i.e.*, $3.43/kg) less a 1 ½% price reduction (*i.e.*, $3.43 - 0.06 = 3.37/kg) in 2006 for the price of Spezyme Ethyl. **A15256:22-15257:5**. The 1 ½% price reduction is what Novozymes would have expected had Spezyme Ethyl not been on the market. **A15257:17-23**.

199. Ms. Davis determined the net margin on Liquozyme as of the date the '031 patent issued. **A15268:10-14**.

200. She adjusted the net margin, after discussions with Novozymes to determine what deductions should be in the ordinary course of business, by subtracting freight according to documents used in Novozymes' Richard Olofson's testimony (*i.e.*, $0.18/kg) and subtracted that from the net margin reflected in the Novozymes documents. **A15268:15-15269:7; A15269:17-15270:1**.

201. Mr. Olofson is the Finance Manager of NZNA. **A15159:17-25**. He has day-to-day responsibility for the accounting and finance operations at NZNA including accounts receivable, accounts payable, cost accounting, budgeting and reporting, tax management, treasury management, and for ensuring that NZNA complies with corporate accounting policies and local policies and regulations. **A15160:1-10**.

202. The adjusted incremental margin for Liquozyme SC was 74% of the net selling price. **A15269:8-11**.

203. Dr. Teece reported Genencor's net margin for Spezyme Ethyl as 71%. **A15269:12-16**. This is consistent with Ms. Davis' calculation of the 74% net margin for Liquozyme.

204. The substitution or conversion rate of Spezyme Ethyl sales to Liquozyme sales upon withdrawal of Spezyme Ethyl that Ms. Davis used was one to one on a weight basis. **A15256:14-23**.

205. Genencor's Dr. Teece calculated that Novozymes would only capture 83% of Spezyme Ethyl sales, even though Ms. Davis believed that the amount would be 100%. **A15299:15-20**. However in March 2005, there was no Spezyme Xtra product. Its development by Genencor had not even been started then. **A15350:17-25**. Genencor's development of Spezyme Xtra began in June to September 2005, and product was not available until June or July 2006. **A15351:1-6**. Ms. Davis correctly concluded that, "Therefore, in March 2005 it would have been unclear, at best, as to when or if such a product would have been available." **A15351:6-8**.

206. Dr. Teece estimated a weighted average 83% conversion rate to Liquozyme in the first six months after Spezyme Ethyl is withdrawn from the market, *i.e.*, in the but for world. **A15444:19-15445:9**. The 17% that he predicts Novozymes would not recapture includes conversion of Spezyme Ethyl sales to sales of Spezyme Fred, Spezyme Fed L, and Spezyme HPA. **A15445:20-24**. Ms. Davis did not include recapture by these other inferior Genencor products. **A15447:10-16**.

207. As part of lost profits, Ms. Davis also considered a reasonable royalty on sales that were to the U.S. fuel ethanol industry. these sales include foreign sales to fuel ethanol

industry customers and sales anywhere for other industries, such as the food and beverage industry. **A15270:15-23; A15341:25-342:4**. A reasonable royalty was considered for these sales since less was known about them. **A15271:1-10; A15341:25-15342:4**. Ms. Davis and Teece agreed that 8% is a reasonable royalty for these sales outside of the U.S. fuel ethanol industry. **A15515:7-13**.

208. Price erosion affects lost profits since, without price erosion, there would not have been any reason for Novozymes to lower its price of Liquozyme any more than it had anticipated it would have done so in the absence of Spezyme Ethyl. **A15298:3-14**.

209. Ms. Davis determined lost profits on Liquozyme sales that would have been made absent Spezyme Ethyl, using the proper 100% conversion from Spezyme Ethyl to Liquozyme for the lost profits analysis. The total lost profits damages, excluding prejudgment interest, are $17,616,274 in the lost profits on sales in the U.S. fuel ethanol industry + $56,087 in 8% reasonable royalties on other Spezyme Ethyl sales + $2,693,104 in price erosion, for a total through September 2006 of $20,365,465. **A15301:22-24; TE484, A16629-16629**.

210. Using Dr. Teece's 83% conversion or recapture rate of Spezyme Ethyl sales to Liquozyme sales, and transferring the 17% difference to a reasonable royalty basis at a 25% royalty rate, the lost profits would be $14,621,506 in the U.S. fuel ethanol industry + $856,927 in 25% reasonable royalty on the 17% of the U.S. fuel ethanol industry that did not convert to Liquozyme + $56,087 in 8% reasonable royalty on sales in other industry sales + $2,693,104 in price erosion for a total of $18,227,624. **A15300:6-301:6; TE493, A16648**.

211. Dr. Teece testified that that lost profits should be between $3,200,000 and $14,300,000 depending on the assumptions one makes on conversion and price elasticity (**A15435:15-22**); that the reasonable royalty for the sales that are not lost to Novozymes, if one

does not consider NZNA, should be between 17.96% and 9.5% without adjustments and 1.7%-7.7% with adjustments (**A15436:4-23**); that he never gave a lost profit number in his original expert report (**A15494:6-15495:1**); and that he has actually given 40 different lost profits numbers in this case. **A15505:24-15506:6; TE749, A166852**.

G. REASONABLE ROYALTY

212. Ms. Davis considered the *Georgia Pacific* factors to determine the reasonable royalty rate. **A15276:21-24**. She did not consider all fifteen to be equally important. **A15277:18-21**. She considered factors 5 (the commercial relationship between the licensor and licensee, such as, whether they are competitors in the same territory in the same line of business; or whether they are inventor and promoter), 8 (the established profitability of the product made under the patent; its commercial success; and its current popularity), and 15 (the hypothetical negotiation between the willing licensor and the willing licensee) to be the most important factors. **A15277:22-24; A15282:14-15283:1; A15283:27-15284:12**.

213. The licenses produced by the parties were not comparable in terms of the nature of the '031 technology and its importance. **A15278:15-18**. The Genencor and Novozymes licenses reviewed by the damages experts were licenses granted in settlement of various litigations or were cross-licenses. **A15278:20-15279:2; A15353:10-25**.

214. However, one license, the Filamentous Fungi License ("FFL") (**TE339, A16120-16133**), appeared more relevant than others. **A15279:3-9**. The FFL was between Novo Nordisk A/S and Genencor International, is dated February 1995, and was part of a settlement. **A15280:5-12**. The royalty rate in the FFL was a rate of not less than 5% and no more than 8% of net proceeds of sales, depending on the normal royalty rate typically paid for comparable products in comparable markets. **A15280:12-15281:1; A15327:16-19**.

215. The '031 patent technology is more important than the technology that was the subject of the FFL. **A15281:2-15**. The '031 patent is more important because the '031 patent covers an enzyme itself, which is a product, whereas the FFL technology covered a process for making an enzyme and there were other ways to make such an enzyme. **A15281:15-19; A15328:19-24**.

216. The royalty in the Technology License was originally 20% but was amended to 40% after negotiations and agreement with U.S I.R.S and Danish tax authorities. **A15063:14-23; A15074:21-A15075:1; A15079:11-14; TE240, A16033; A15168:10-18; A15169:3-10; TE740**. The 40% royalty rate was taken from an analysis by an outside consulting firm. **A15168:16-19**. The analysis looked at comparable companies that do not own technology and determined the profits those companies achieved over a rolling five year period and what an appropriate royalty would be so that NA would have comparable profits. **A15064:6-12; A15168:19-A15169:2**. The 40% royalty rate between AS and NA was meant to approximate an arm's length transaction. **A15063:25-15064:4; A15067:9-10**.

217. Mr. Olofson testified that this agreement provides for a 40% royalty "to compensate Novozymes AS for the technology that Novozymes North America needs to produce the product." **A150168:1-5**.

218. Dr. Teece testified that he did a study on adjudicated royalties in the fields of biotechnology and chemistry and found the royalties to be 9.6 and 11.98, respectively. **A15486:19-15487:1**. The study article was not admitted into evidence, so there is no way to know the specifics of these previously adjudicated cases. Dr. Teece reported royalty rates in the biotechnology industry, which he agrees is the relevant industry in this case, ranged as high as

50%. Royalty rates were also this high in the pharmaceutical, internet, media, entertainment, and medical health products industries. **A15516:17-15517:5; TE771, A16870**.

219. Licensing Economics Review reports the following royalty rates: overall industry average (6.7%), chemicals (4.7%), food, (4.0), pharmaceutical and biotechnology (7.3%), and energy and environment (5.0%). **A15489:25-15490:13; TE771, A16870**. However, rates for individual licenses as opposed to averages do reach into the double digits. **A15517:16-17**.

220. The parties would be expected to arrive at a non-exclusive license for any product manufactured or sold in the U.S. **A15281:23-25**.

221. Novozymes generally does not outlicense to generate revenue. **A15015:23-15016:7**.

222. Novozymes rarely outlicenses its core technology. **A15015:23-15016:7; A15282:6-13**. Core technology is important to its businesses in which Novozymes has a strong position. Core technology relates to the areas in which Novozymes itself operates. **A15016:12-19**. Novozymes spends a lot of money to develop its technology, to maintain it, and to develop new production techniques and strains for use by the Novozymes companies. **A15064:13-20**.

223. Novozymes' Mr. Meyer testified that "We will not jeopardize our business by licensing out technology. So that is our core business and we will not do that." **A15016:19-21**. The '031 patent is definitely core technology." **A15017:6-7**. "It governs some products that are very important in the fuel industry area, in the fuel alpha-amylase area and that is a very, very profitable and very important business area for Novozymes." **A15017:19-22**.

224. Mr. Meyer further testified that Novozymes has outlicensed core technology on "very specific occasions when it really is worth it" such as in a cross-license of intellectual property rights, licenses with big customers under joint development agreements, and in

settlement of litigation. However, Novozymes is "not in the business to sell technology." **A15045:17-15046:25; A15047:6-15048:10; A15320:8-22.**

225. Novozymes has outlicensed non-core in very specific circumstances. **A15016:7-25; A15017:8-13.**

226. Novozymes and Genencor are competitors with respect to Liquozyme and Spezyme Ethyl. Therefore, there would be an expectation that Novozymes would lose sales if it were to license the '031 patent technology to someone else. **A15282:14-15283:1.** The only instances in which these parties have licensed one another were in settlement of pending or threatened litigation. **A15321:16-23.**

227. However, litigation between the parties has not always resulted in a license.

228. The '038 patent was asserted by Novozymes, in 2001, against EBS and its Ultra-pHlo product. **A15020:24-15021:7.** Genencor acquired EBS during the '038 patent litigation. **A15021:10-11.**

229. During the litigation between Genencor (then, EBS) and Novozymes, Genencor asked for a license under the '038 patent for Ultra-pHlo. Novozymes refused to license Genencor since the '038 patent was core technology. Genencor withdrew Ultra-pHlo from the market. **A15021:14-24.**

230. Customers in the dry mill fuel ethanol industry typically buy alpha-amylases and glucoamylases. **A15420:4-7.** Some sales of glucoamylase are driven by the choice of the alpha-amylase supplier. These glucoamylase sales are primarily sales to new plants. **A15283:13-19; A15323:23-15324:2.** However, Mr. Faller testified that "alpha-amylase is much more a key driver of whether you will get the glucoamylase than whether the glucoamylase is the driver of whether you will get the alpha-amylase business. **A15134:4-7.**

231. Genencor's glucoamylase product is Genzyme 480. **A15419:18-22**.

232. Novozymes' competing glucoamylase product is Spirzyme Fuel. **A15419:23-15420:3**.

233. Genencor, in August 2003, acknowledged Novozymes' success in getting 100% of a customer's enzyme business and Genencor's need for an viable alpha-amylase product to be able to do so itself. "In contrast to NZ, who has recently found success packaging products in 100% supply offers, Genencor cannot possibly be 100% enzyme supplier to many customers until we have a new, viable AA [alpha-amylase]." **TE230, A16018**.

234. Most recently, RPBG bought both alpha-amylase and glucoamylase from Genencor. **A15115:14-16**.

235. The '031 patent expires in 2016. Ms. Davis assumed that the license would be for the term of the patent. **A15283:20-24**.

236. The relevant period to look at net profit margin for Spezyme Ethyl is the last six months of Spezyme Ethyl sales since the first six months of sales included start-up and launch costs associated with a new product. **A15332:3-10**. Liquozyme and Spezyme Ethyl are very profitable products (71% net margin for Spezyme Ethyl and 74% net margin for Liquozyme), and therefore, the royalty rate in this case will be higher than that for a product that is not as profitable. **A15283:25-15284:12**.

237. The fact that Liquozyme does not fall within the '031 patent is of no import, since it is the product that would be sold in competition with the infringing Spezyme Ethyl product, and Liquozyme sales would be lost if Novozymes were to grant a license under the '031 patent. **A15284:13-23**.

238. Spezyme Ethyl has become an extremely popular and successful product for Genencor with sales during the damages period of over 7,000,000 kg. **A15285:13-15286:3; TE485, A16630.**

239. The profits generated by Spezyme Ethyl should be attributed completely to the '031 patent technology because without that technology, Spezyme Ethyl probably would not have been sold. **A15286:12-21.**

240. The time of the hypothetical negotiation is March 2005, the issue date of the '031 patent. **A15314:11-13.**

241. Ms. Davis testified that a hypothetical negotiation would have resulted in a reasonable royalty rate of 25% for sales in the U.S. dry mill fuel ethanol industry.

242. Two important metrics support this 25% royalty rate - the Rule of Thumb and the analytical method. **A15289:22-15290:2.**

243. The Rule of Thumb, as used in the licensing business, suggests that the royalty should equal a quarter to a third of the profits attributable to the invention. **A15290:5-8; A15330:15-22.**

244. The Rule of Thumb in this case results in a royalty rate between 18 and 24% (*i.e.*, 25-33% of 74%). **A15291:12-14; TE490, A16640.**

245. Dr. Teece used the Rule of Thumb incorrectly to calculate his ultimate royalty rate of between 5.7 and 11.01%. **A15460:4-11; A15479:10-19; A15482:13-22.**

246. The analytical method suggests that the royalty rate should be set at the difference between the profit margin on the patented product and the normal profit margin for that business. **A15291:15-22.**

247. Genencor's Dr. Teece agreed that the margins of the infringing product and of the best product that would take its place at the time the '031 patent issued would be significant factors in the hypothetical negotiations. **A15511:10-16; A15512:1-4**. He also agreed that Spezyme Fred would be a reasonable benchmark if Spezyme Xtra were not the correct one to use. **A15519:1-5**.

248. Spezyme Xtra was not available at the time of the issuance of the '031 patent, so its margin is not appropriately used in this analytical method metric. **A15335:17-21**. Even if Spezyme Xtra were in development at the time of the issuance of the '031 patent, there would not have been information about the product, its acceptance or its pricing and margin other than a possible launch, that would have enabled the hypothetical negotiators to have made comparisons with Spezyme Xtra at the time of the negotiation, *i.e.*, March 2005. **A15337:10-16**. Ms. Davis correctly concluded that "It would be fairly speculative for the hypothetical negotiators to try to rely upon an expectation that there would be such a product [Spezyme Xtra] in mind what the profit margins were likely to be on that particular product." **A15351:12-17**.

249. Ms. Davis correctly explained that "So if Genencor is generating margins of 71 percent on the Spezyme Ethyl product, at the date if the hypothetical negotiation, they would be trying very hard to protect those margins and they wouldn't yet know what the margins would be on the Xtra product. They could only compare with the ... Fred product. So that relevant comparison on the analytical method is in fact with the known margin on Fred at the time of the issuance of the '031 patent." **A15539:10-17**. As Ms. Davis testified, "It would be fairly speculative for the hypothetical negotiators to try to rely upon an expectation that there would be such a product [Spezyme Xtra] in mind [and] what the profit margins were likely to be on that particular product." **A15351:12-17**.

250. Dr. Teece found the profit on Spezyme Ethyl from using the '031 patent to be $11,000,000, the profit on Spezyme Xtra if substituted for all of those sales to have been $6,800,000, and the difference to be $4,300,000, which would be the incremental profit due to the '031 patent. **A15476:21-15478:14**. He suggested that 25-33% of that incremental profit should go to Novozymes. **A15479:7-9**.

251. Alternatively, Dr. Teece testified that the reasonable royalty rate should be between 5.9 and 11.5%. **A15293:3-7; A15460:4-11**. He explained that the differences between his royalty rates and the 25% suggested by Ms. Davis were due to what he termed strong substitution possibilities having been available including the foreseeability of Spezyme Xtra. **A15463:6-17**. His hypothetical negotiations included, as a major presumption, that Spezyme Xtra was either available or reasonably foreseeable in March 2005. **A15509:20-15510:6**. However, Dr. Teece's negotiations and his resulting royalty rates are not realistic because there is no evidence that Dr. Teece's underlying assumption that Spezyme Xtra would be an available and acceptable substitute for Spezyme Ethyl is correct. **A15293:10-15**.

252. Ms. Davis correctly disagreed with him because "At the date of the hypothetical [negotiations, the] negotiators would be aware that the Liquozyme margin was about 74 percent. So they would be sitting at the table across form one another recognizing that the margin for one party is 74 percent, the margin for the other party is 71 percent. It would be silly for them to think that the appropriate royalty rate would be in the 8 to 11 percent range for the fuel ethanol market." **A15540:1-7**.

253. Spezyme Ethyl had been on the market for about one year when the '031 patent issued, so the profit margin for the product had been established, i.e., 71%. Therefore, the parties would have recognized that the product was extremely profitable and that Spezyme Ethyl sales

were taking away from Liquozyme sales. Therefore, the royalty should be 25% of net sales in the fuel ethanol industry. **A15287:5-21; A15289:6-21**.

254. The difference between the profit margins of Spezyme Ethyl (71%) and Spezyme Fred (44%) is 27%, based upon the appropriate period which is the six months of sales immediately before the issuance of the '031 patent. **A15292:1-19; A15335:1-7; TE491, A16642**. This margin is based upon the last six months of Spezyme Ethyl sales which did not include start-up and launch costs of a new product since the negotiators in the hypothetical negotiation would be concerned with what the net profit would be going forward, not in retrospect at the beginning of the sales of a new product. This later profit margin would be reflective of what customers were willing to pay and of the stabilized market of an established product. **A15333:7-16**. Genencor's Dr. Teece agreed that eliminating a start-up spending period at the introduction of a new product is correct. **A15483:6-25**.

255. These margins hold even in view of price erosion unless production was moved to another facility or the production facility was otherwise changed. **A15335:8-13**. Ms. Davis explained that in the hypothetical negotiations, the parties would consider price erosion because the putative licensor who is also selling a product in that market "would be looking for some sort of compensation to make sure that they were not losing more than just the sale itself." **A15334:7-12**.

256. The Rule of Thumb and the Analytical Method give a royalty rate range in the relevant industry of from 18-27%. A 25% royalty rate is reasonable and still leaves Genencor with a significant profit margin. **A15292:20-15293:2**.

257. The parties, at the time of the hypothetical negotiation would have recognized that the product was extremely profitable and that Spezyme Ethyl sales were taking away from

Liquozyme sales. Therefore, the royalty should be 25% of net sales in the fuel ethanol industry. **A15287:5-21; A15289:6-21**.

258. In a hypothetical negotiation, Genencor would be willing to pay a 25% royalty in the U.S dry mill fuel ethanol industry because that would allow Genencor to sell Spezyme Ethyl as opposed to losing sales because of an unacceptable product such as Spezyme Fred. **A15552:4-10**.

259. If there were no lost profits, one would still use two royalty rates, one for the U.S fuel ethanol industry and one for all other industries. The royalty rate for fuel ethanol is different because in that industry, the parties are competing head-to-head. This means that Novozymes would lose profits by licensing Genencor. **A15288:12-20**. The reasonable royalty outside of the fuel ethanol industry would be 8% for reason above (lost profit testimony). **A15288:1-7; A15289:17-19**.

260. This would result in $5,040,621 as a reasonable royalty (at 25%) on sales to the U.S. fuel ethanol industry and $56,087 (at 8%) to other industries for a total of $5,096,780. **A15347:4-15; A15348:13-20**. This is determined by taking Genencor's sales figures in TE483 and adjusting them to use EDC's selling price to its customers rather than Genencor's price to EDC for the EDC sales, thereby eliminating the 10% discount between Genencor and EDC. **A15347:16-15348:12**.

H. WILLFULNESS AND EXCEPTIONAL CASE

261. Each Genencor project team has a legal person assigned to it. **A15408:2-6**.

262. On September 29, 2004, Novozymes sent a letter to Genencor providing a copy of the allowed claims that eventually issued in the '031 patent on March 15, 2005. **DI194 at III.A.; TE320, A16074-16119**. The letter was sent to Christopher Stone, Genencor's Director of

Intellectual Property and Senior Patent Counsel, and Margaret Horn, Genencor's General Counsel. **A15220:2-17**.

263. This is contrary to Genencor's contention that it became aware of the '031 patent only upon its issuance on March 15, 2005. **A15210:4-7**.

264. Mr. Faller testified that this notice was sent to Genencor because Novozymes "had been encountering Spezyme Ethyl in the marketplace and had determined that the product -- that [Novozymes] believed that [Spezyme Ethyl] was violating our patent, and so we sent them this notice of this patent that was about to issue." **A15129:23-15130:4**.

265. The letter informed Genencor that the claims in the '031 patent had been allowed by the U.S. Patent and Trademark Office ("USPTO") and made specific reference to the applicability of the '031 patent to Spezyme Ethyl. **A15128:19-15129:7; TE320, A16074**. This letter put Genencor on notice that the claims that issued in the '031 patent had been allowed by the USPTO. **A15216:12-17**.

266. Mr. Stone informed various people at Genencor, including Dr. Crabb, of the receipt of this letter. He also provided them with a copy of the '031 patent allowed claims. **A15220:18-15221:12**.

267. Those at Genencor who were informed y Mr. Stone of the letter and the allowed claims understood that those claims would issue as a patent after payment of the issue fee. **A15221:13-19**.

268. Dr. Crabb was one of the people informed by Mr. Stone of the letter and allowed claims, but Dr. Crabb did nothing upon receipt of this information and these claims. **A15222:19-23**.